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NASA TECH BRIEF

Marshall Space Flight Center

Solar-Cell Interconnects

A study has been made of thermocompression bonding as a technique for fabricating the electrical interconnections of solar-cell arrays. Thermocompression bonding has been used widely to attach interconnect leads for integrated circuits. Attaching interconnects to solar-cell arrays is a similar problem involving somewhat different materials. However, until now, little research or development had been done on this application.

Integrated-circuit chips commonly have electrodes of vapor-deposited aluminum to which gold or aluminum interconnect wires are bonded; solar cells generally have silver-coated electrodes. In the study it was found that useful bonds to the solar cells can be formed with silver ribbon, silver-plated copper ribbon, and aluminum ribbon. Bonds were formed at from 300° to 400° C and with enough contact pressure to produce some deformation of the interconnect ribbon. Other materials such as molybdenum, nickel, palladium, tin, and titanium were investigated, but none of these were found to form bonds with satisfactory pull and peel strengths.

The increase of the bonding time beyond 1 second did not increase bond strengths, and bonding for as long as 1 minute did not damage the solar cells (shallow-diffused violet cells). Bonding strength increased both with increasing temperature and pressure; however, temperatures above 400° C were not tested as the cells are damaged above this temperature. Pressure may be applied up to the point where cell damage occurs or the ribbon is squeezed to one-half its original thickness at the bond area. One of the best set of conditions found was at 400° C with 25 kg applied to a 15-mil by 30-mil (0.4-mm by 0.8-mm) bonding area.

Note:

Requests for further information may be made in writing to:

Technology Utilization Officer
Marshall Space Flight Center
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Patent status:

NASA has decided not to apply for a patent.

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